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Liang, Sim Boon; Young, Wong Ching

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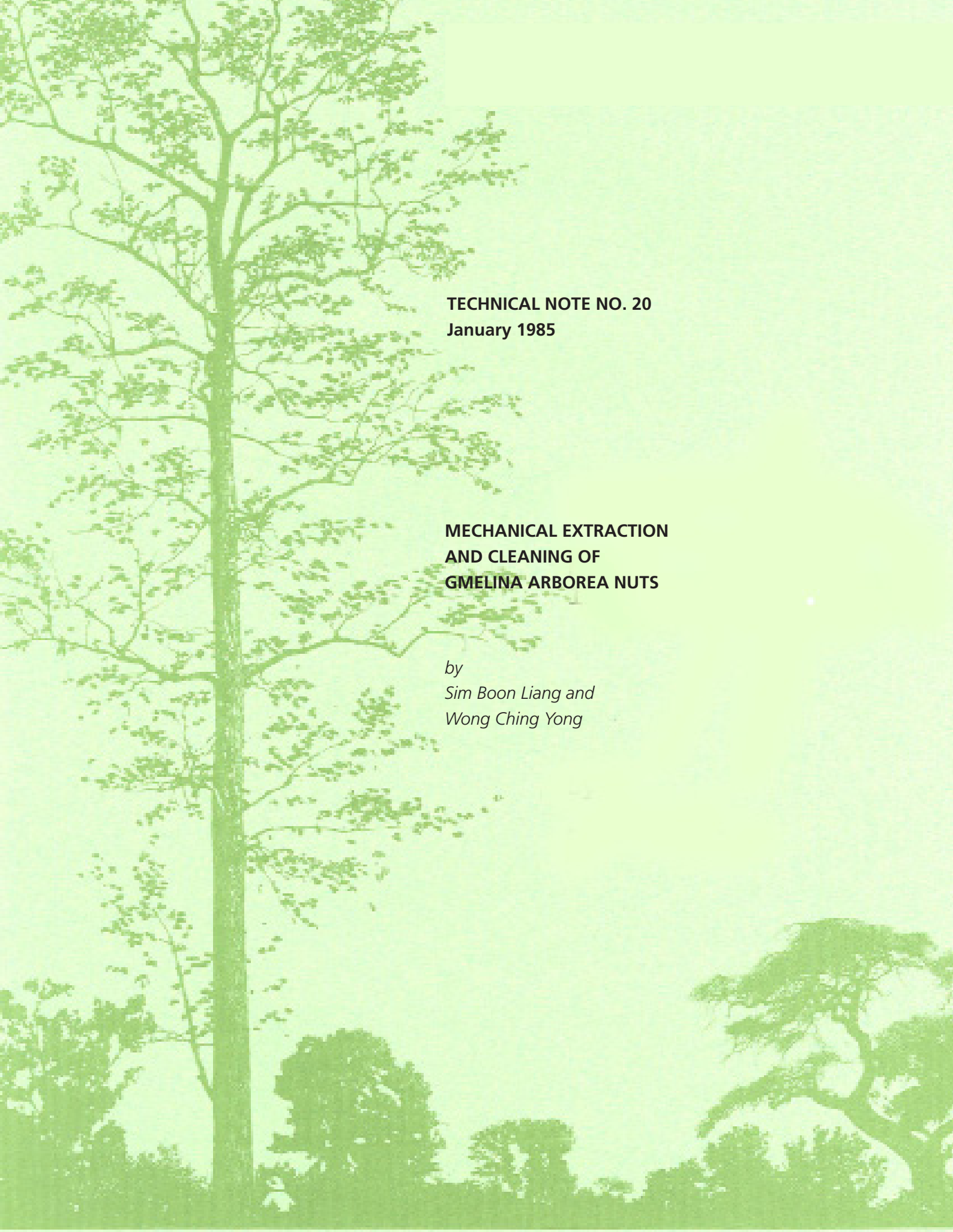

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MECHANICAL EXTRACTION AND CLEANING OF GMELINA ARBOREA NUTS

by
Sim Boon Liang and
Wong Ching Yong

DANIDA FOREST SEED CENTRE

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Author
Sim Boon Liang and Wong Ching Yong

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SUMMARY

The separation of nuts from pulp by processing *Gmelina arborea* fruits in a modified coffee depulper, followed by polishing the nuts in a coffee dehusker, has shown an overwhelming advantage over hand cleaning in terms of cost / efficiency of production and improvement of germination. These small machines are simple and economical, costing around 1500 US$ each, and they can be made locally in ordinary garage workshops.

1. INTRODUCTION

Gmelina arborea nuts were conventionally extracted by soaking the fruit in water for several days and letting the pulp soften and ferment. The fermented pulp was then rubbed off by hand and thrown away. Nuts extracted by pulp fermentation become black and germinate poorly.

Another common practice was to squeeze a few fruits at a time between two boards. The action splits the pulp open releasing the nut. The nuts, however, were not completely free from pulp which affected the germination considerably. This method was rather slow and inefficient.

An improvement was made by tumbling the fruits in a cement mixer with cubes of wood (FAO 1982). Care must be taken to choose blocks of wood that are heavy enough to depulp the fleshy drupe but not so heavy that the nuts are cracked.

In order to be able to process large commercial quantities of nuts efficiently, a mechanical extraction and cleaning method was developed for Sabah Softwoods Sdn. Bhd. (Sim 1981).

The dehusker may also be used for extracting leguminous seed like *Acacia mangium* from its dry pod.

The method involves three stages: depulping, cleaning/drying and polishing.

2. DEPULPING

A small modified coffee depulper is used. The machine (see figure 1) consists of a toothed rotating drum and an adjustable feeding plate. Fruits are poured into the feeding funnel (a) and pass the toothed drum (c), which presses the fruits against the feeding plate (b) and strips the pulp off without crushing the nuts. The pulp is thus separated from the nuts and is discharged through a separate outlet (e) at the bottom of the machine. The nuts come out through the outlet (d). The shutter (f) is opened when the drum is to be cleaned.

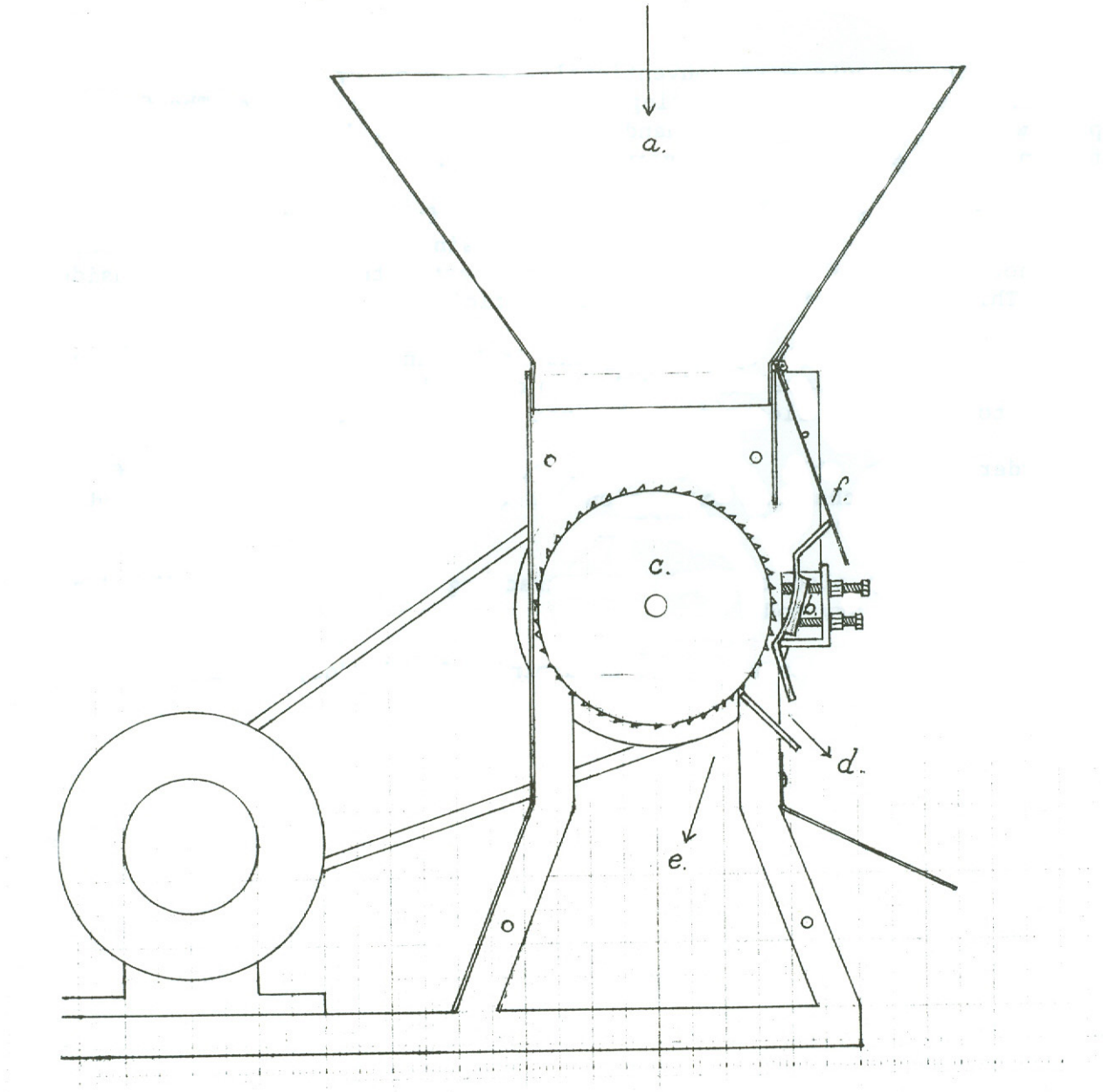
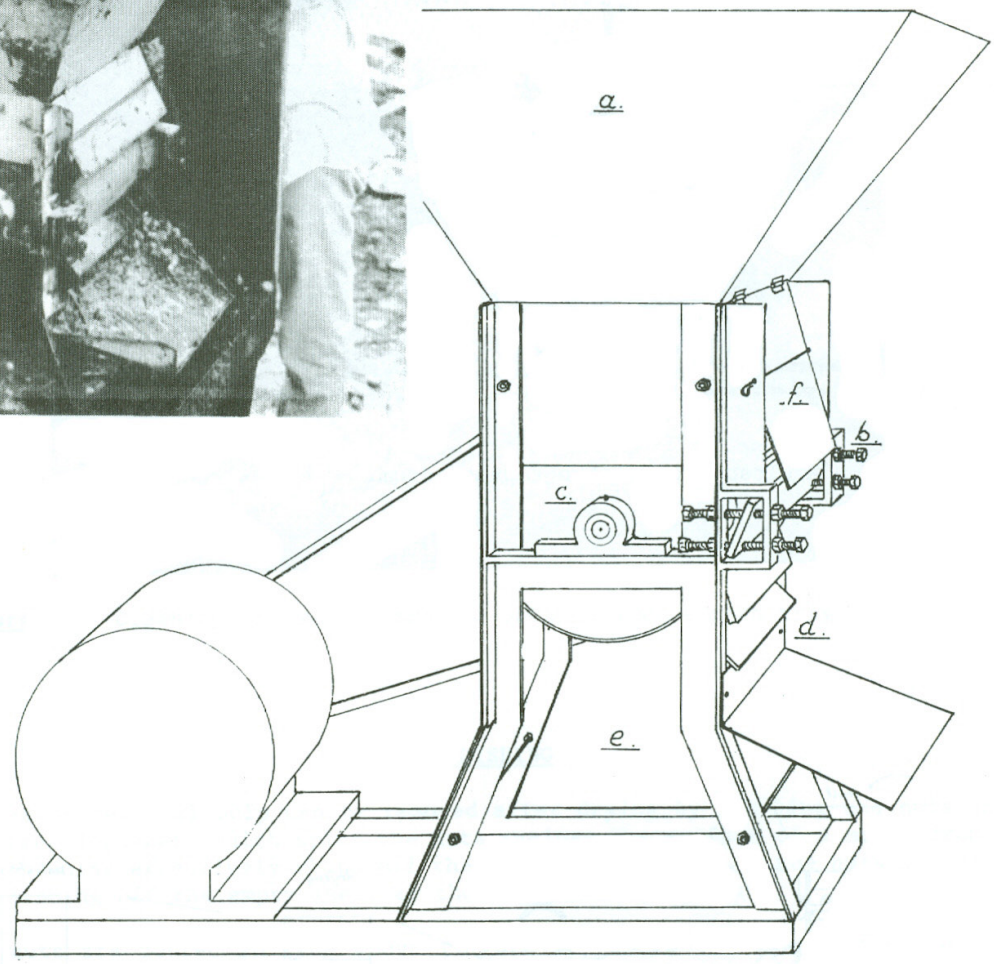


Figure 1 A modified coffee depulper



Dimensions:

Length	41.0 cm	Number of rotations per minute	
Width	30.5 cm	of electric motor	1420
Height	62.0 cm	of drum	680
Diam. of drum	17.5 cm	Diam. of wheel at motor	10 cm
Number of teeth		at drum	21 cm
per row across the drum	30		
Number of rows	63		

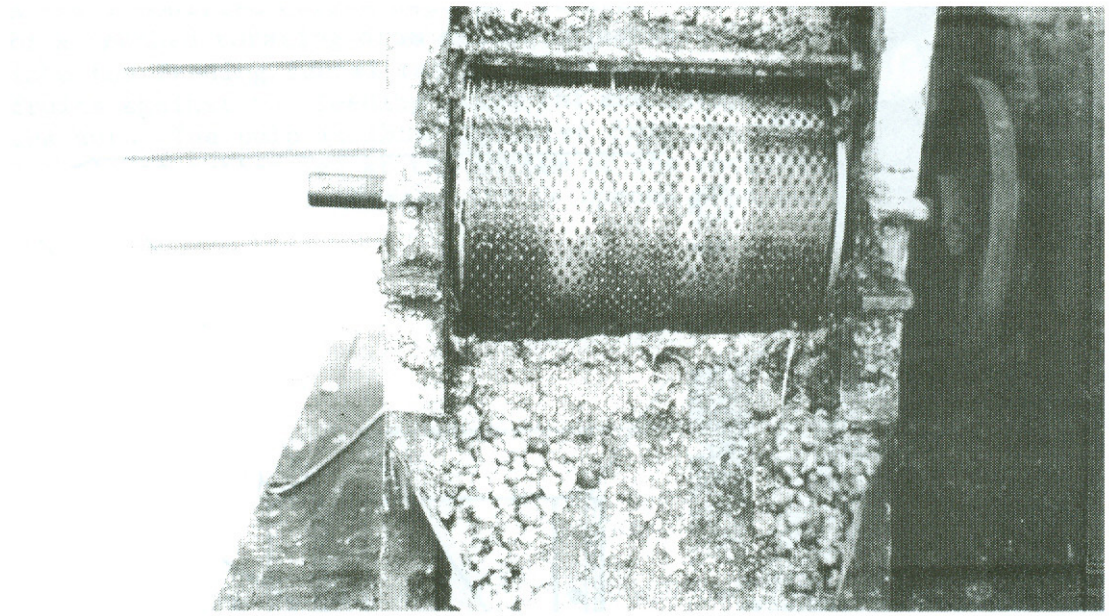


Figure 2 A close view of the toothed drum.

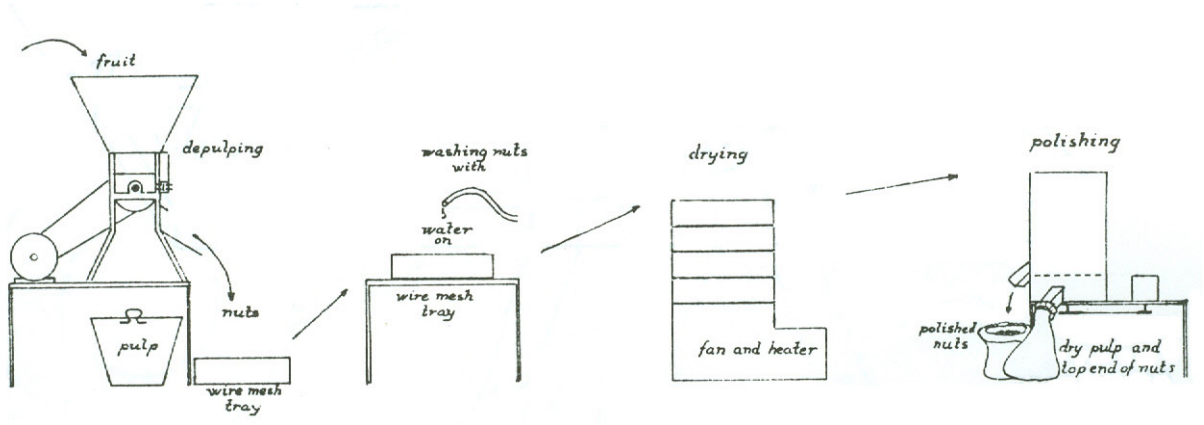


Figure 3 Mechanical extraction and cleaning of Gmelina arborea *nuts. Survey of process*

3. CLEANING AND DRYING

The nuts are spread out on a wire mesh tray after depulping and rinsed with water to remove juice and traces of loose pulp. The nuts are then dried under warm air at 40-60°C for 2 days. This reduces the moisture content to 5-8 %, which is sufficient to ensure adequate storage at 4°C.

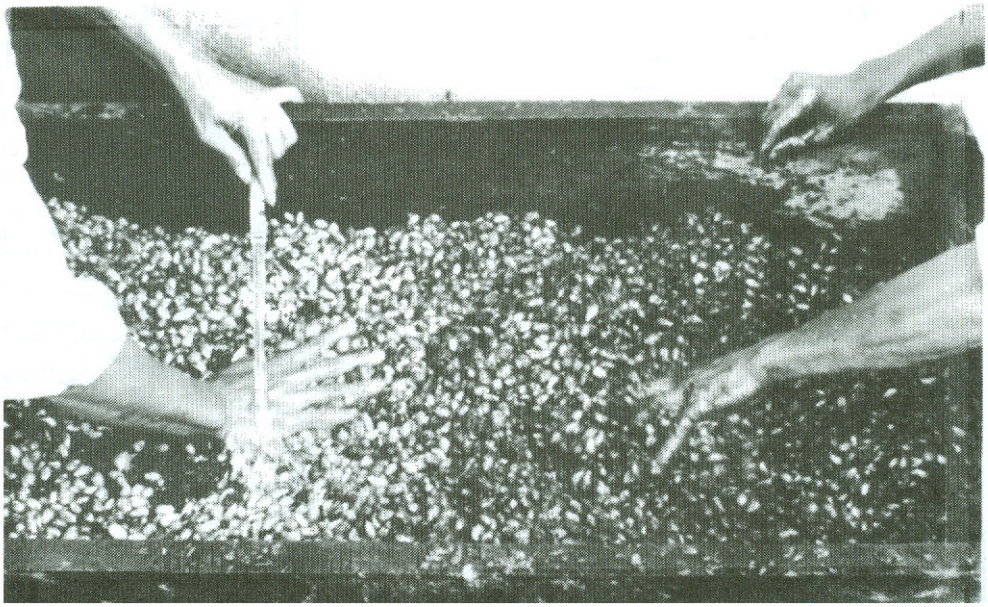


Figure 4 *Cleaning of* Gmelina arborea *nuts on a wire mesh tray.*

4. POLISHING

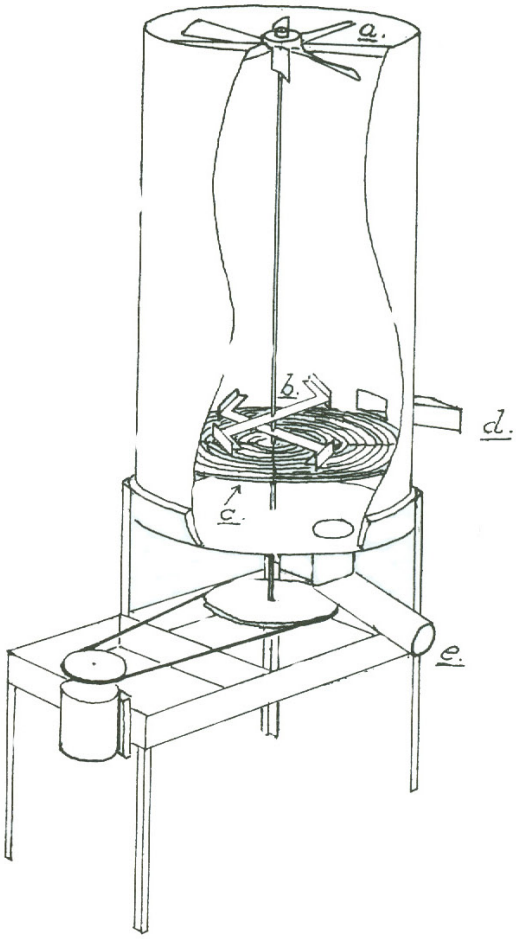
Traces of residual pulp can be removed after drying by tumbling the nuts in a coffee dehusker, which spins the nuts against the surface of a metal drum. The spinning effectively chips off the dry pulp sticking on the nuts as well as chipping off the empty shell at the sharp end of the nut.

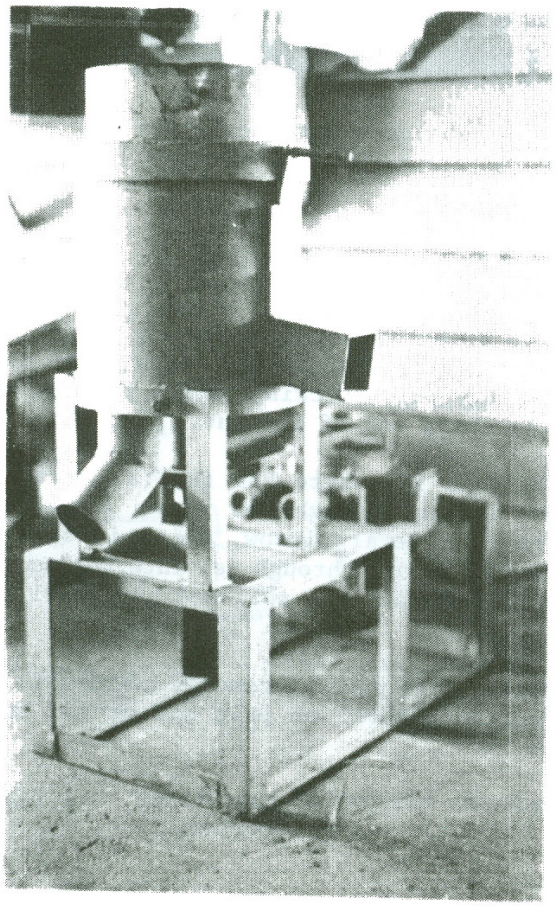
The nuts are poured in from above (figure 5), where the fan (a) creates a downward current that blows out the debris through the sieve (c) into a rubbish bag. At the outlet (d) there is a metal window, which is operated manually. When no more debris is being forced out through (e) into the rubbish bag, the operator will lift the metal window and the polished nuts will fall out into a sack.

The polishing takes less than 30 seconds. This process removes completely any pulp or dirt from the nuts. The complete removal of pulp has proved to be necessary for good germination.

Figure 5.

A coffee dehusker for nut polishing





Dimensions:

Height of dehusker	49 cm
Diam. of drum	32 cm
Number of rotations per minute of motor	950

5. COMPARING THE EFFECT ON GERMINATION OF DIFFERENT EXTRACTION METHODS

The germination test tabulated below indicates that *Gmelina arborea* pulp must be totally removed in order to secure adequate germination. The pulp sticking on the nuts ferments in the seed bed and affects germination significantly. *Gmelina arborea* nuts that are extracted and polished mechanically show good germination percentage, equivalent to cleaning each nut by hand. The result stresses the importance of polishing the nuts by using the dehusker, which removes all traces of pulp.

Extraction method	Germination %
Nuts extracted and cleaned manually	99
Nuts extracted and polished mechanically	93
Nuts extracted by squeezing between two boards	67
Whole sun dried fruits	0

The dehusker may also be used for extracting leguminous seed like *Acacia mangium* from its dry pod. The rotating blades crush the dry pods thereby releasing the seed, which are then forced through the sieve and blown out through (e) together with some fine debris. When no more seed is discharged through (e), the window at (d) is lifted to discharge the empty pods and twigs. The seed and fine debris collected from (e) are then sieved or winnowed.

6. SUPPLIER

The NOVA Coffee pulper is produced by Bentall - E.H. Bentall & Co. Ltd.
Maldon
Essex CM9 7NW, England

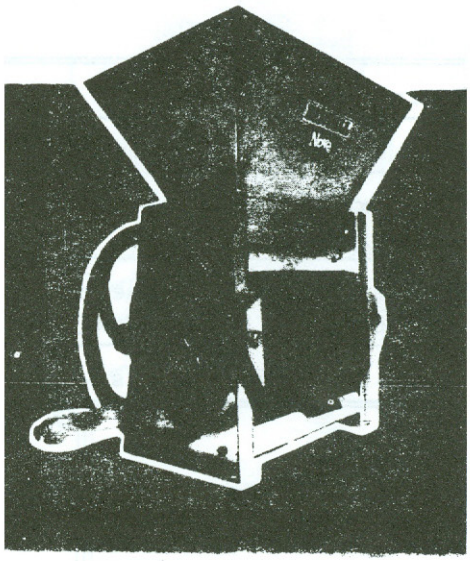
'NOVA' COFFEE PULPERS

Modern production methods and engineering have improved the traditional cast iron pulper and resulted in a machine with lower cost and greater efficiency

The 'Nova' is available in two types:
For hand power only, or
Power-drive

Approximate capacity per hour
Hand power: : 300 kilos of fresh ripe coffee cherry
Power-drive: : 600 kilos of fresh ripe coffee cherry

Easily dismantled and re-assembled the 'Nova' is simple, robusst and efficient.



The depulper used by Sabah Softwoods Sdn. Bhd. was made locally by Shim Kon Sang Workshop, P.O. Box 436, Tawau, Sabah, Malaysia.

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